Hobbies WEEKLY

CONTENTS

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A HOME-MADE ROCKING CHAIR

THIS comfortable design of chair is quite within the scope of the home woodworker, and is well worth the time and labour of constructing. If there is a choice of timber in the matter, then oak or beech is about the best wood to use, otherwise a good quality deal can be used and should make a substantial article of furniture.

Framework

Fig. 1 is a side view of the chair, and Fig. 2 a front view, giving the necessary dimensions. Any other measurements necessary can be taken as the work progresses, or will be found in the text. A cutting list at the end of the article is added, as a help to ordering the wood.

The legs are cut from 1½in. square wood, and should be cut to the length given, plus 1in. at the bottom for the tenons entering the rockers, and ½in. at top for the stub tenons entering the arm rests. The former are cut ½in. thick and 1in. deep; the latter ¾in. square and ½in. high. Details of these are given in Fig. 3, also of the joints used for the rails.

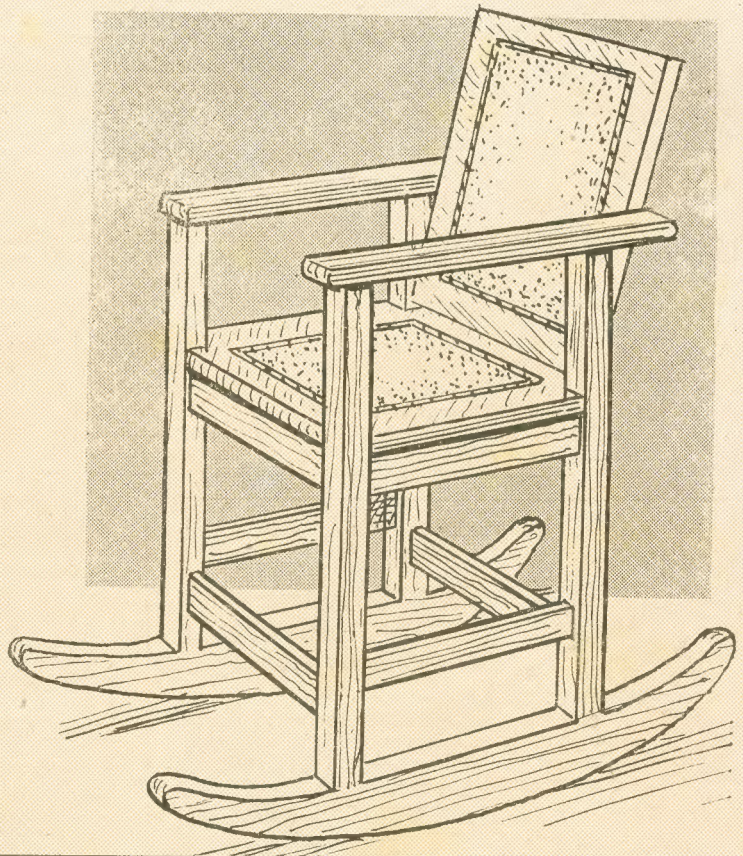
The seat rails are of 1in. by 1½in. wood. The tenons are 1in. long and ½in. thick, and as they meet together in the mortises in the legs, the ends of them have to be neatly mitred.

Lower Rails

The lower side rails are 4ins. up from the bottom, the front and rear rails 2ins. up. Tenons for these are ½in. thick and 1in. long. These rails are also of 1in. by 1½in. wood. Make the tenons a close neat fit for their respective mortises to better ensure a good fit. Try them in position.

The arm rests are cut to length given in Fig. 1 from 1in. by 2in. wood. Note that these are to be fitted on the top of the legs with their broader side down. At 1in. from one end of each, on the undersides, chisel out ¾in. square by ½in. deep mortises to fit the stub tenons on the legs.

Try in place, then mark out the position of the mortises for the rear legs to fit in and cut these out. It will be seen that the arm rests project about ⅝in. over the front legs and about 3½ins. over the back ones. The extra extension at the rear is to provide for



the chair back fitting at a comfortable slope.

All these parts except the arm rests, can now be glued together. Knock all joints well home and leave the framework for the glue to get hard. In the meantime, the seat and back frames can be put together.

A plan view of the framework (arm rests omitted) is given in Fig. 4 (A), which will help to make clear some of the above details of construction. On this the seat frame (B) is to be laid. This is a frame of 1in. by 3in. wood for side and rear pieces, and 1in. by 2in. for the front piece. The parts can be just halved together and glued.

At each corner a 1½in. square is cut out to fit over the legs. The front edge is neatly rounded off for comfort. When the corners are cut away, a screw or two can be driven in the joints at each corner, underneath, to stiffen the whole.

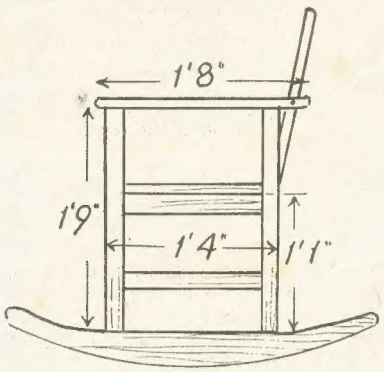


Fig. 1—Side view of main parts

The back frame is seen in Figs. 1 and 2, and is similarly made up as the seat frame, from 1in. by 2in. wood. Readers who do not mind a little extra trouble can well joint both frames together with mortise and tenon joints and make a more professional looking article. This back frame is then hinged to the seat frame, after the latter is fitted in place, with 2in. iron butt hinges, as at (C), Fig. 5.

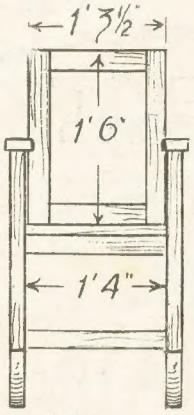


Fig. 2—Front view of chair

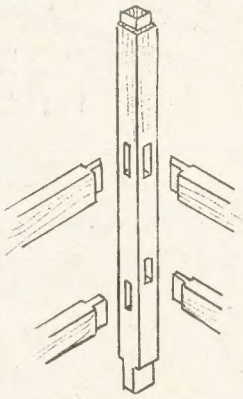


Fig. 3—Detail of joints

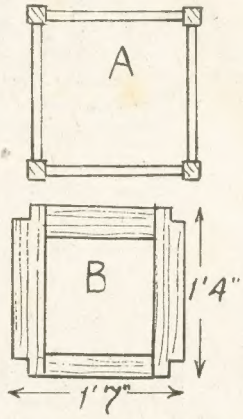


Fig. 4—Plan of seat frames

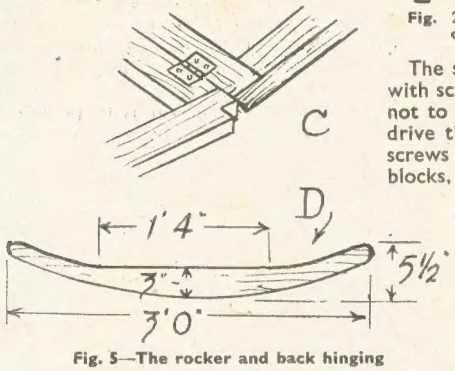


Fig. 5—The rocker and back hinging

The seat frame is fixed over the rails with screws, driven in from underneath, not to be on view. To avoid having to drive the screws through the rails, the screws can be driven through wood blocks, one each side, the blocks themselves being screwed to the rails on the inside. The arm rests can now be glued in place.

To complete the woodwork part of the job, only the rockers are now required. These are detailed more clearly at (D) in Fig. 5. They are cut from wood 1¼ins. to 1⅛ins. thick, and 5⅛ins. long. First, from the centre part of the top edge, cut out a piece 1ft. 4ins. long, and 2½ins. deep, then from there, each side, shape up to the ends.

Leave the bottom curve for the moment. Place the chair on the rockers and mark with a pencil the shape of the tenons on the legs as a guide to cutting the mortises for them in the rockers. These mortises are cut 1in. deep.

If fit is satisfactory, mark the curved bottom, either with a length of string and a pencil (the old stunt) or by bending a flexible strip of thin wood from one end of the rocker to the other. A smooth curve is necessary here. When satisfactory, saw out with a keyhole saw, or better still, a bow saw.

Now glue the chair to its rockers. Fit the back at a comfortable slope, either with a screw at each side or pegs, the latter fitting in a hole in each arm rest. Two or more such holes can be bored, then the back can be adjusted to a different slope, as preferred, within limits, of course. Too much backward slope is undesirable, as the chair might topple over sometime.

Glasspaper the work, then stain and varnish oak or walnut colour, as desired. Simple upholstery can be carried out to seat and back, as instructed in previous numbers of Hobbies, or both can be just webbed, and covered with American cloth or other materials, and comfort ensured by the addition of cushions.

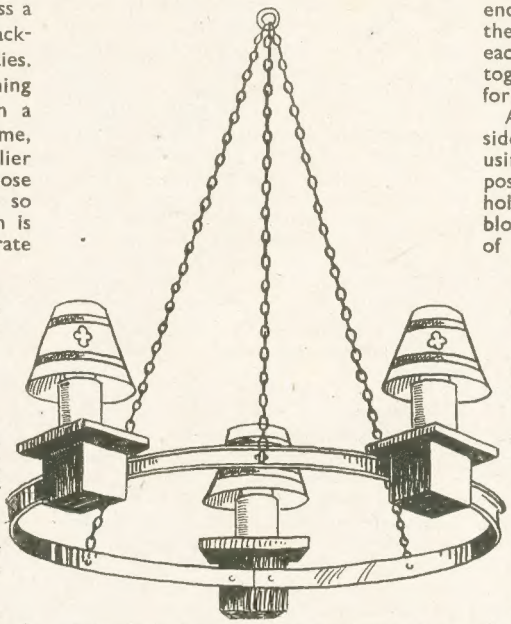
CUTTING LIST

Legs (4)—1½ins. by 1½ins. by 1ft. 10½ins.
Rails (4)—1in. by 1½ins. by 1ft. 3ins.
Rails (4)—1in. by 1½ins. by 1ft. 6ins.
Arm rests (2)—1in. by 2ins. by 1ft. 8ins.
Rockers (2)—1½ins. by 5½ins. by 3ft. 0ins.
For seat and back frames—1in. by 2ins. by 8ft. run.
For seat and back frames—1in. by 3ins. by 5ft. run.
One pair of 2in. iron butt hinges.

Curtain rail and wood blocks make an attractive electric LIGHT PENDANT

ELECTRIC candle pendants possess a certain character which seems lacking in the bowl-and-shade varieties. They are adaptable to most furnishing styles, and they fit equally well in a modern chromium-and-plastic scheme, or the dark-oak and pewter of an earlier period. The main problem is that those displayed in the shops are usually so expensive that an alternative, which is attractive only by reason of its moderate price, is often made to do.

But it is possible to overcome this problem, and with very little trouble produce a candle pendant at a cost of only a few shillings.



Curtain Rail

The main shape of the pendant can be contrived from a strip of brass curtain railway and a corresponding valance rail, such as can be bought at most department stores. The length of each piece should be 3ft. 6ins. They should be laid together so the valance rail fits snugly between the flanges on one side of the curtain strip.

With the valance rail on the inside, bend both strips to form a complete and perfect circle, 13½ins. in diameter. It is a good plan to use the garden roller as an anvil on which to beat out any irregularities in the shape, but use only a wooden mallet so as to avoid marring or flattening the soft brass of the strips.

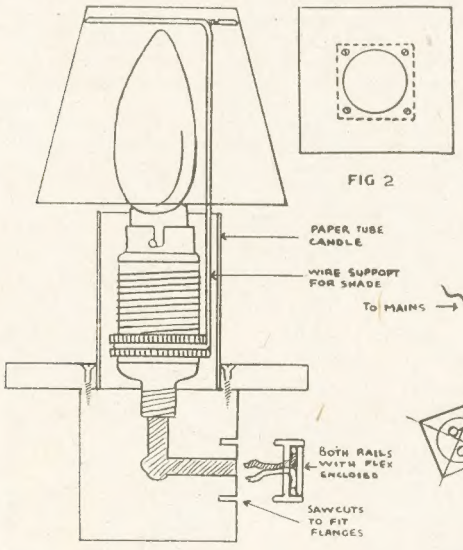


FIG 1

FIG 2

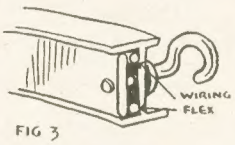


FIG 3

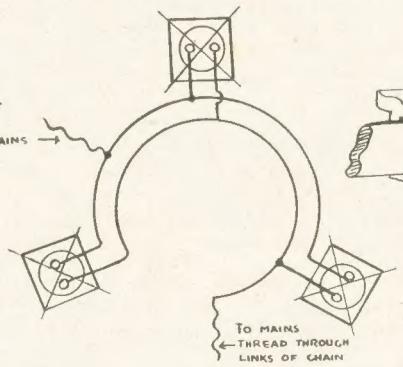


FIG 4

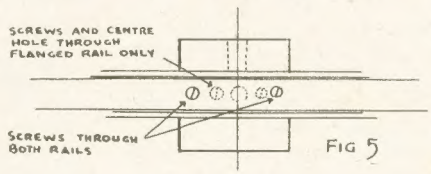


FIG 5

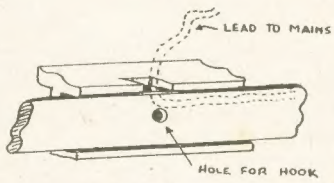


FIG 6

The candle holders are 2in. blocks cut from any scrap length of 2in. square wood, although it is best if this is of oak. Similarly, the flat top pieces, which are 3ins. square, can be cut from scrap pieces, ¼in. thick.

The blocks should be properly squared up and glasspapered to a fine finish, particularly the two faces presenting the end grain. The edges are best rounded just sufficiently to relieve the sharpness of the angle. Mark the exact centre of two adjoining sides of each block, and drill a ¼in. hole a little more than halfway through the blocks from each selected face. The two drillings will thus meet at right angles in the centre (Fig. 1).

The flanged curtain strip is also drilled with two ¼in. holes, spaced exactly 14ins. along the circumference, measuring from the cut ends. The third hole is made at the actual point where these ends join. It is cut with a circular file in the form of a semi-circular notch on each edge, so when they are brought together a hole ¼in. in diameter is formed.

At a point ⅜in. distance from either side of the three holes drill smaller holes, using an ⅛in. drill. Place the blocks in position round the strip so the ¼in. holes coincide exactly and mark on each block the points where the flanged edges of the strip make contact. At these marks, make saw-cuts just deep enough to receive the flanges snugly (Fig. 1).

Fix the blocks firmly to the brass strip with small brass screws inserted from the inside of the ring through the small ⅛in. holes. The two screws at the extreme ends of the strip will serve the dual purpose of fixing the block into position and, at the same time, join the strip into the complete circular form.

Bulb Holders

The flat 3in. squares for the top pieces should be finished with glasspaper to match the blocks, and in the exact centre of each cut a hole 1¼ins. diameter. The squares are centred over the uppermost holes in the blocks and fixed into position with four small counter- sunk screws (Fig. 2).

The bases or bushes of the bulb-holders are also centred and fixed into position over the ¼in. holes in the blocks. If the imitation candle type of bulb is being used for the completed pendant, miniature bulb-holders will be required. But if it is intended to use bulbs of a higher wattage, standard-size holders should be fitted (Fig. 1).

Wiring of the holders is in parallel, and is carried out with light, single flex so one wire can be tucked away under the shoulder of the upper flange, while the other is laid along the flange on the bottom edge of the brass rail (Fig. 4). Leave 2ft. or 3ft. of flex free on each side of the wiring, but arrange that these lead off from opposite ends so they may

be threaded through the links of separate hanging chains to the ceiling rose (Fig. 4).

The valance rail is fitted on the inside of the curtain rail ring for the purpose of enclosing the wiring and making a neat finish. The inside diameter being slightly smaller, it will be necessary to trim 1in. or so from the end of the valance rail before the join will meet flush. Arrange that the join comes at the centre of one of the blocks, but it should not be that on which the flanged strip is joined.

Rail Fixing

The valance rail is fixed to the blocks in the same manner as the flanged strip, except that holes for the screws are drilled at points ¾in. on either side of the centre line of the blocks (Fig. 5). In making these drillings and fitting the screws take care that the insulation of the wiring is not cut or damaged.

Further ¼in. holes are drilled through the centre of both strips exactly midway between each block to take hooks for hanging the fitting. Immediately above two of these holes the inside flange of the outside rail should be cut away to form outlets through which the two free ends of flex are threaded (Fig. 6).

The hooks for hanging the pendant are provided by three brass cup or dresser-hooks. These are fitted in the holes between the blocks, and the portion of the shank which protrudes on the inside of the ring is filed off to within $\frac{1}{16}$in. of the rail. The stub is burred over in the manner of a rivet (Fig. 3).

Chain Hangers

The chains which are attached to the hooks may be of the pressed-link, picture-hanging variety, but the links should be sufficiently open to allow the supply flex to be threaded through. Alternatively, a very effective chain can be made up at home with a few dozen of those links shaped like a figure 8, which can be obtained from the same store which supplied the curtain railway. The length of the chains will, of course, be governed by the height of the ceiling.

The 'candles' are made from strips of white cartridge paper or thin card, rolled to form a tube 1¼ins. diameter and sufficiently high to hide the bulb holder, without hindering the fixing of the bulb.

The Shades

The shades can be bought, ready-made, or they, too, can be made from cones of white drawing paper. An exclusive design can be drawn in coloured inks and the shade coated with toilet paraffin or other white oil to render it transparent.

Each shade is supported by a short piece of stiff wire, bent to a circular shape at each end. The top circle should be the same in diameter as the upper edge of the shade, and the lower end of the wire should be bent to fit round the bulb-holder, where it is fixed in position by the screwed locking ring provided (Fig. 1).

In common with all such items which are designed to suit a certain home, the final finish of the completed fitting is a matter of personal taste. If it is intended for a modern scheme of furnishing, the brass ring may be left bright, and the wooden candle-holders stained to match the furniture and brushed over with button polish.

Wrought Iron Effect

To conform to the character of an earlier period, the whole of the pendant can be painted black, with the effect of wrought iron. Or, again, the wooden parts may be stained dark-oak colour and polished with beeswax, and the brass 'oxidized' or toned down to match with a brushing of the same stain.

The chains should, of course, harmonise, and it is advisable to decide first upon the style of finish which is being adopted, so that the chains can be obtained either bright or oxidised, according to the appearance of the finished job. Be sure to fix the whole thing firmly to the ceiling.

For awkward or out-of-the-way branches make this

EXTENSION PRUNING TOOL

IT will soon be time to start trimming your shrubs and trees, and it is not always easy to reach all the odd twigs even with the aid of a pair of steps or ladder. The short time required to make the little gadget described here will be amply repaid by its usefulness. However inaccessible a branch may seem it will be possible to reach it with this handy pruner.

An ordinary pair of hand secateurs is firmly fastened to the top of a long wood handle by means of a piece of sheet metal bent to shape and bolted on. The act of cutting being worked by a wire from the handle of the secateurs and leading down the wooden handle.

A piece of fairly stout gauge sheet metal is needed. This must not be so thick that it is impossible to bend it to the necessary shape. It is not important what metal is used; brass is probably the best on account of its easy working qualities.

The Metal Holder

A piece 9ins. long and 3ins. wide should be large enough, although the exact size depends on the size and shape of your cutters. For the same reason no definite measurements can be given as to where to bend the sheet in order to hold the cutters.

We will assume the width of the handle is about ½in., so if you mark this width down the centre of the sheet you will be able to make two right angle bends down the entire length.

Now slip the handle of the cutters in and mark the position for the two bolt holes. They should be made as close to the handle as possible and can take ¼in. metal screws with nuts. When the nuts are screwed up tight, the cutters should be held quite rigid. Some types of cutters are made with curved handles and it may be necessary to cut a piece of wood to fit and wedge them up tightly.

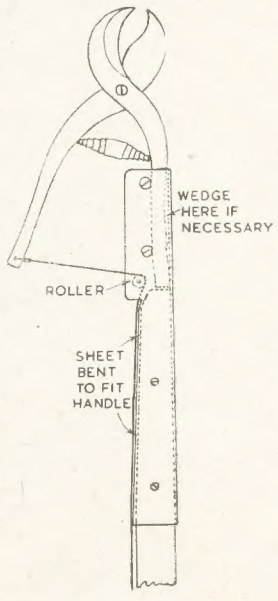
Wheel for Wire

Just below the bottom bolt hole is a roller for the wire to pass over. It is quite small and can be made from a piece of tube placed over a wire nail and riveted over. When the bottom bolt is screwed up the roller should not be tight, but should just be free enough to roll easily.

The bottom part of the sheet metal holder is bent over to fit round the wooden pole. A piece about 1in. square would be about right for this. The top part can be tapered slightly to fit and then screwed on with two wood screws. The pole can be made any length to suit your needs.

The wire to operate the cutters is fixed to the bottom of the free handle. Flexible steel wire such as is used on a cycle three speed is best for the purpose.

Some cutters have a hole or clip to fasten the handles when not in use. The wire can be easily fixed here. Otherwise it will be necessary to twist it round the handle and bind securely with a piece of copper wire. Lead the wire over the roller and down the pole handle where it can pass through a screw eye and end by being fastened to a metal curtain ring.



Keep the cutters well oiled and make sure that the blades are always sharp. In this condition they should not give any trouble and should prove one of the gardener's most useful tools.

How the amateur electrician can instal various types of BURGLAR ALARMS

MANY different forms of burglar alarm are to be found, but the simplest types are quite straightforward and may easily be fitted up without difficulty. A loud electric bell is commonly used. This sounds when any window is opened, thus warning the owner, while at the same time making the burglar know his attempted housebreaking is discovered. Such an arrangement is an effective crime preventer, it being assumed few burglars would endeavour to complete their plan in the face of an unexpected clamorous warning bell.

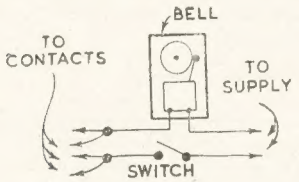


Fig. 1—The wiring system

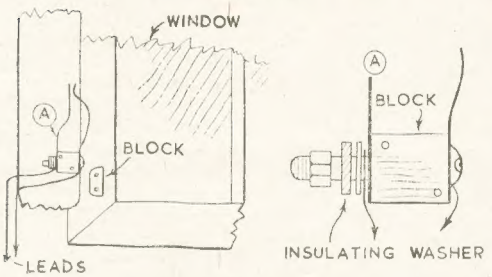


Fig. 2—Contacts for window and door

An arrangement whereby the same result is achieved when anyone steps on a mat placed in a doorway or elsewhere is also possible, and this can be modified for use in shops to serve as a warning that a customer has entered.

Bell Circuit

Fig. 1 shows this part of the installation and if two terminals are provided as many leads as desired may be taken to the contacts, the closing of which will cause the bell to ring.

The supply may be obtained from an accumulator, dry cells (bell batteries being best), or a bell transformer wired to the mains. This is a matter for personal preference.

The switch is included so the circuit may be put out of action during the daylight hours when many people may be coming or going on normal business. The bell may be situated in the hall or some other centralised position, or installed in a private room, if preferred. Many types of electric bell are readily obtainable.

If the bell is driven from a mains transformer, then the primary of this transformer is connected to the mains and the secondary, which will usually deliver between 4 and 8 volts, will supply the bell circuit.. No difficulty should arise here, but it should be remembered that transformers will only operate from A.C. mains, not from D.C. mains.

Window and Door Contacts

Fig. 2 shows how these may be arranged, and the detail at A will enable the contacts to be made. The small block of wood or other insulating material can be about ½in. or ⅝in. square and is drilled with two small holes so it can be screwed to the fixed part of the window or door frame.

The contact pieces should be about 2ins. long and ¼ in. wide, and may be held in place by a bolt with insulated washer, as shown, or by using small wood-screws. If the latter method is employed the points of the screws must not touch inside the block or there will be a continuous short-circuit.

A small block is also screwed to the window, and the strips are so bent that when the window is opened the one strip is pushed firmly against the other.

With doors, the block may be screwed so the strips project outwards above the door. When the latter is opened, the top edge will press the strips together and if the contacts are fairly near the hinged side of the door the circuit will be kept closed for a considerable movement of the door itself.

Wiring Up

Cheap twin flex can be used for wiring, and the leads may be run as far as possible out of sight, and in the most convenient manner, back to the two terminals connected to the bell and switch shown in Fig. 1.

All the pairs of contacts used will be wired in parallel and numerous pairs of contacts may be looped in to a single run of twin flex where this is convenient. If leads are kept close against wall and woodwork there will be no unsightly or loose connections visible, and insulated staples can be used as a further aid to obtaining a reliable and neat wiring arrangement.

A Latching Relay

With the arrangement already described, the bell will cease to ring when the window or door is moved to a position which permits the contacts to open again. With an arrangement intended to show when customers enter a shop, this is in order, but with a burglar alarm it is desirable that the bell should continue to ring until turned off by the householder.

By using a relay which locks itself in the 'On' position once energised, this can be arranged. Such a relay is shown in Fig. 3. When the magnets are energised, even if only for a moment, the armature is pulled behind the catch, thus completing the circuit between armature and catch, which causes the bell to ring. If the window or door is closed and the circuit broken, the magnets are no longer energised, but the armature still remains behind the tip of the catch until the latter is drawn back by hand, freeing the armature.

Two bell magnets, or bobbins about ¾in. in diameter and 1in. long wound with 22 S.W.G. wire can be used. They should have iron cores and be wound in different directions, viewing them from their free ends. Armature and catch can be cut from iron or tinplate, supported on springy strips of metal bolted to small brackets. The whole can easily be made on a small piece of wood, following the arrangement illustrated.

Doormat Contacts

The drawing at Fig. 4 illustrates an arrangement which can be placed under any mat. So that it will give a long period of service the plywood used should be of good quality and well varnished both sides. The sheets should be large—about 2ft. by 1ft. at least, and are held apart by narrow strips all round.

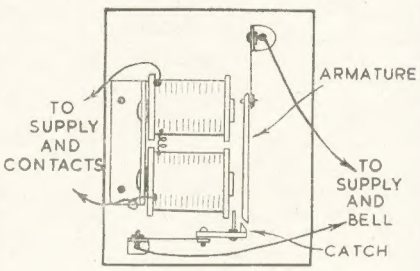


Fig. 3—A latching relay

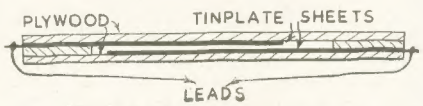


Fig. 4—Section of doormat contact

Two large sheets of tinplate form the contacts, one being on top of the lower piece of plywood, and the other underneath the upper plywood. The distance between the metal sheets will be quite small and a person's weight will cause the circuit to be completed.

All the sheets may be secured together by a number of small woodscrews passing through the various thicknesses of material.

The whole thing is placed under a doormat and this, when trodden upon makes contact and so creates an alarm. It is useful, of course, as a warning when anyone comes into a shop apart from its usefulness in other directions.

A useful adjunct to workshop or kitchen is this folding DROP-LEAF BENCH-TABLE

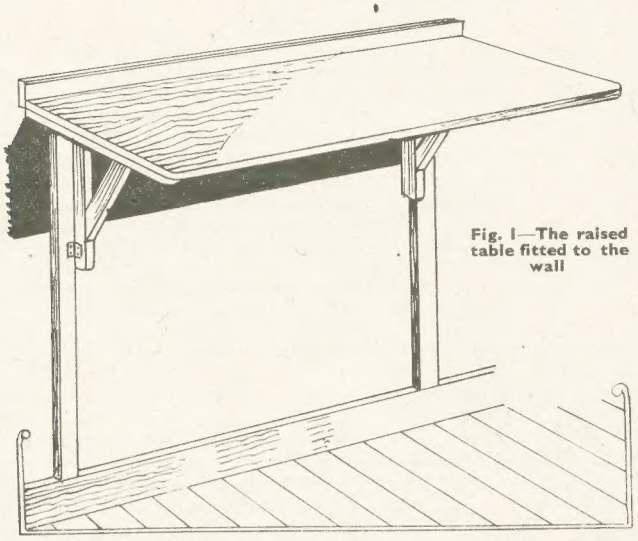


Fig. 1—The raised table fitted to the wall

THE flap table shown here complete in Fig. 1 is simple to make and a most suitable addition where space is limited. As it folds down flat against the wall, it really takes up but very little space. Deal would be the most suitable wood to use to make up the table, as only the simple mortise and tenon joint is used to frame the parts together

This work should come within the scope of the average amateur woodworker. The table is made in four parts, consisting of a back frame, the table top and two brackets. The back frame is first prepared and fixed to the wall.

The table top is hinged to the top rail of this frame, and the brackets, which support the top are hinged to the side upright rails of the frame.

The Wall Frame

Fig. 2 gives details of the back frame and the brackets with dimensions for a table of useful size. The various joints, etc., are given in the details, Figs. 3 to 7.

A start may be made upon the back frame, see Fig. 2. This consists of a top rail (A), 36ins. long, and two upright rails (B), the length of these being decided by the height the table is required from the floor. Rail (A) might be 2ins. by $\frac{3}{4}$in. in section while the side rails (B) might be $1\frac{1}{2}$ins. by $\frac{3}{4}$in. in section.

The top and side rails are halved together, as Fig. 4 shows, the halvings being carefully marked out before cutting with the small-tooth tenon saw and chisel. Glue and screws will be used to hold the joints firmly.

The width between the upright rails is given in Fig. 2. The front top edge of the rail (A) should be chamfered or rounded off neatly. The framework can be fixed to the wall by means of Rawlplugs or wood pins cemented into the wall in which the screws may be put.

The lower ends of the upright rails should rest upon the top edge of the skirting or direct upon the floor in its absence. The next operation is the making of the brackets, see Figs. 2 and 3.

Support Brackets

Each bracket consists of an upright (C), a top rail (D) and the support (E), and wood $1\frac{1}{2}$ins. by $\frac{3}{4}$in. in section is suitable for all these parts. Two methods of framing the rails together are shown in Figs. 5 and 6. In the former figure, the rails (C) and (D) are halved together, and the support (E) recessed into (C).

This is the simplest form of jointing, while that shown in Fig. 6 is, perhaps, the stronger, but at the same time is more difficult to mark out and to cut. Glue should be used to secure the joints, with screws put in where possible. The outer ends of the rails (C) and (D) should be cut round with the fretsaw and made smooth with coarse and fine glasspaper.

The brackets are then hinged to the side rails of the back frame, in the manner shown in Figs. 2 and 3. Four brass 2in. hinges should be used.

The Table Top

The table top will be the next consideration and the detail of its simple construction is given in Fig. 7. Two planed boards about 36ins. long and $7\frac{1}{2}$ins. wide or three boards 5ins. wide are glued and securely held near their ends by cross battens 2ins. by $\frac{3}{4}$in. in section.

Three grooved and tongued boards would make the stiffest table with side ledges glued and screwed, as shown in the detail. The screws should be brass and countersunk neatly. Round off the forward corners of the table before fixing it. The table is fixed with brass hinges to the lower edge of the frame rail (A).

The underneath cross battens will fall flush with the wall. A pair of flap hinges will be used and put on, as detail Fig. 7 indicates. Care must be exercised in fitting the flap to see that it rests level and squarely on top of the two brackets when these latter are brought forward.

To finish the table, the back frame, brackets, and the underside of the top should be stained and varnished, or the whole could be painted to match the paint of the room or hall wherever it might be fixed. This work of finishing should be carefully and properly undertaken, particularly if the bench is in the hall.

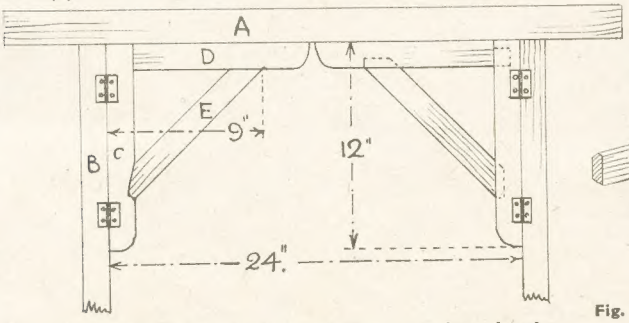


Fig. 2—Showing wall framework and support brackets closed

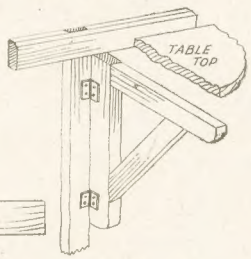


Fig. 3—The bracket hinged

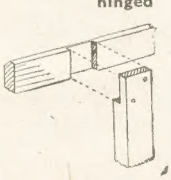


Fig. 4—Halving joint

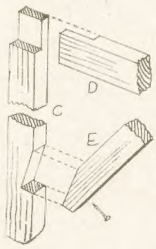


Fig. 5—Angle joints

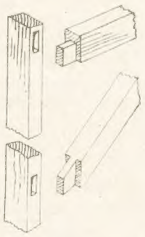


Fig. 6—Mortise joints

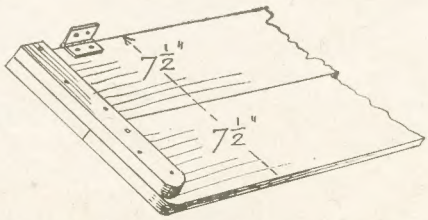


Fig. 7—Under view of table, strut and hinge

You can have interesting studies if you make this

SIMPLE MICROSCOPE

THE owner of a microscope is to be envied just now, especially with the very high-price of these optical instruments. Many readers would like to possess one but feel they cannot afford it. It is very nice to know, therefore, that this need not deter them, as it is really quite a simple matter to build up a very efficient little instrument. The cost need not run to more than a few shillings, and it is even possible that you may already possess all the necessary parts and can start right away.

The study of microscopy is one of the most interesting of hobbies, and besides being highly instructive it can lead you to do some research work that may be of real value to science. It is a hobby that we can indulge in at all times of the year, as there is always plenty of matter available for examination.

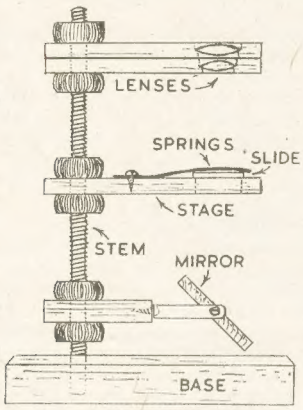


Fig. 1—Side view showing parts

Fig. 3—The lens arm

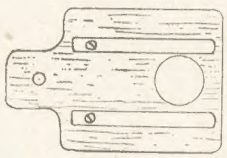


Fig. 4—The stage and slide

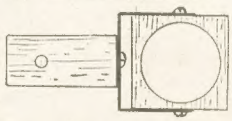


Fig. 5—The mirror holder

Fig 2—Lens types

For the observation of many things the simple microscope described on this page is more useful than a high power-expensive instrument; and even when you can afford to make or buy a better one this simple apparatus will still be needed quite a lot.

The Lens

The most important part of any microscope is the lens. The very simple ones need only one, but the larger compound microscopes often have quite an array of lenses. A most interesting article on lenses has appeared in a recent issue of 'Hobbies Weekly', and much useful information can be obtained from this article.

If you have not got an odd lens or two, you can easily buy one from an optician, or a tour round a second-hand shop should provide something quite cheaply. A small convex lens of any kind is what is wanted—it may be a double convex as Fig. 2(A) or it can be a plano convex Fig. 2(B). It is even possible to use two or three of these on top of each other in order to obtain more magnification.

The Stand

A very essential feature of a microscope is a good steady stand, so the heavier you make the baseboard the better. Oak, walnut or mahogany about 1in. thick 6ins. long and 4ins. wide will do nicely. Bevel the top edges and glass-paper quite smooth. If you like you can make a sink in the base and fill in with lead, afterwards covering it over with a piece of baize.

The stem shown in Fig. 1 which holds the lens, stage and mirror is an 8in. length of screwed brass rod. A radio shop should be able to supply this, also the six nuts to fit on to it. The best size is 0 B.A., but if this is a job to obtain, 2 B.A. will do, although it will not make such a steady stem.

Drill a hole in the base about 1½in. from the end perfectly upright, tap it and screw in the stem. It is very necessary that it should be a tight fit and if you cannot do the job yourself the radio shop will probably be able to help you.

We will mount the lens or lenses next—two are shown in Fig. 1 but you may have only one or you can use three or more. Quite an elaborate and indeed very useful microscope might have half a dozen different lenses of various powers all on the stem—those not wanted can be swung out of the way until another power is needed.

A lens having a focal length of 1in. is a very useful size to start off with—this will give an amplification of about ten diameters. It is mounted firmly into a piece of wood—mahogany is probably the best to work with and the size will depend somewhat on the diameter and thickness of the lens (see Fig. 3).

About 4½ins. is a good length and the width should be just sufficient to hold the lens secure. The thickness must be a trifle more than the thickness of the lens so as to avoid any scratching when the wooden arms are swung round.

Make the stem hole an easy fit: the arms are tightened with the thumb screws on the stem. When mounting several lenses it is very important that the distance from the stem hole to the centre of the lens should all be the same.

After the lenses are mounted we need a stage on which to place the slides and objects we wish to examine. It is somewhat similar to the lens arm and is shown in Fig. 4. The distance from the stem hole to the centre of the hole must be the same as the lens arm.

The Stage

A useful size for the stage would be 3ins. wide which will allow for a hole 1in. diameter and a spring along each side to hold the slides secure. The thickness need not be more than ¼in. Strips of thin sheet brass about 3in. long and ¼in. wide will do for the two springs, which are held in position by small round head screws.

In order to illuminate most of the specimens which you will examine it is necessary to have a small adjustable mirror fixed underneath the stage to reflect the light on to or through the object.

Fig. 5 shows how to mount the mirror, which can be 1½ins. to 2ins. diameter. A piece of wood just a little larger than the mirror is used to hold it secure, and it can be let into the wood so that it is flush with the top—a spot of glue will hold it in place.

The Mirror

The mirror is now fitted into what is called a 'gimbal' mount, which will enable it to be twisted into any position. A strip of stout brass bent to the shape shown in Fig. 5 is fixed to the centre of the mirror block with round head screws. The other swivelling motion is given to the gimbal by screwing the centre of the strip to a short block of wood, which in turn slides down the microscope stem and takes its position near its base.

It is important that the distance from the stem hole to the centre of the mirror should be the same as for the lens arms. To complete the microscope and to give it a somewhat professional appearance all the wood parts should be french polished.

A Container

It is quite a good idea to make a box to keep the instrument in when it is not being used. Dust and damp are the enemies of microscopes and especially of the slides, and therefore it is up to you to do your best to protect them.

Having built your microscope a few words on how to use it to the best advantage will not be out of place here. The object you wish to examine is placed on a slide, clipped on to the stage and centred over the hole. A slide is a piece of thin glass about 3ins. long and 1in. wide.

Swing the largest and lowest power single lens into position and then adjust the mirror so that it throws the source of light on to the slide. It is now only necessary to bring the object into focus and this is perhaps best done by screwing

(*Continued foot of page* 360)

Patterns are printed full size on page 365 for completing

A NOVELTY CUT-OUT

HERE is a novel and colourful cut-out picture plaque for those who are able to cut accurately to line with a fine fretsaw. Two copies of the design are needed; either two printed patterns taken from two copies of the magazine, or a tracing of the outlines can be made. This is transferred to the wood with carbon paper and a hard, sharp-pointed pencil, and the original retained as a reference to the painting.

The pattern is, then, by one or other means, transferred to the wood and the outlines only cut. The small silhouetted sketch shows what the wood will look like at this stage. The wood must be plywood with the outside grain the long way of the figures, and need not be more than ⅛in. thick. Thin plastic sheet may well be used.

After cutting out, glasspaper well and use, where necessary, a small fretwork file or glasspaper to remove any 'whiskers'. The drawing can then be touched up with a pencil and finally painted with bright enamels. Before doing this, the edges can be blacked.

As regards colours, the following are merely hints, though they are based on colours of actual peasant costumes. First figure (left): Pea-green hat, red shirt with white spots, brown trousers, black boots. Second figure: White hat, black hair, brown blouse, red skirt with yellow spots, blue apron, white stockings, black shoes with yellow buckle. Third figure: Pea-green hat and jacket, the latter with yellow buttons at the back, black boots. Fourth figure: Black hat, white shirt, green breeches and braces, blue stockings, black shoes. Fifth figure: White blouse, purple skirt, lilac apron, white stockings, black shoes, brown hat with yellow ribbons.

The grass is light green and the tree foliage a darker green, the trunks being brown. One or two small flowers may be painted on the grass. For flesh tint, mix white, yellow and red (only a little red). For pea green, add some blue to the green. Red and black make a good brown.

This plaque may be hung against a plain wall. Two small squares of ply may be glued to the rear of the top corners so small screw-eyes may be driven in, from behind, for hanging purposes.

The plaque, however, may well be backed. For example, cut another sheet of thin ply to exactly the same size as the overall dimensions of the fretted piece. Paint this sky blue all over. Let it dry thoroughly. Apply glue very carefully to the back of the fretted piece (which has already been coloured). Lay the fretted piece over the blue piece and keep under pressure until the glue has set.

As already hinted, extreme care must be taken to see that no glue oozes out on to the blue, as this would completely spoil the effect. Keep the glue (tube glue) well within the boundaries of the fretted part and allow for the glue to move outwards a bit when pressure is applied.

Backing the Figures

It is possible to have a silhouetted effect by blacking the whole of the fretted part instead of colouring it. If this is done, it is best to lower the rear grass line a bit so that more of the feet appear in silhouette.

Having made such a plaque, the reader may care to design others. If not his own original designs, then those can be adapted from illustrations in books, provided, of course, such designs are not made up in quantity and sold commercially.

It is best to avoid full-face views and to rely on back views and profiles. Fine projections should be avoided. For example, in the design just described, the hat ribbons of the figure on the right are superimposed on the tree. It is quite possible to frame such pictures. A sheet of glass would certainly keep out dust.

Uneven Foliage

In cutting the foliage at the top, there is no need to keep too accurately to the printed outline, but, especially around the figures, care is essential. At the same time, an academic standard of art is not required. It will be noted, for example, that the hands have been put in very simply.

It is intended that the pattern be cleaned right off the paper before painting. If, however, the reader is unusually shaky in art matters, it is possible to glue the printed pattern on the wood. Besides holding the paper firmly, the *glue* will also act as size. The enamels can be painted over the paper, the guide lines for the feet, etc., remaining there.

Microscope—(*Continued from page* 359)

the stage up or down and then clamping it tight with the other screw.

Increasing Power

After you have inspected your object with the lowest power lens you can increase the power by using another lens, and then you may use two together, not forgetting to bring the object into focus with each change of lens.

At first you will probably want to examine anything you can lay your hands on, but later on you may decide to specialize in one or two subjects and learn all you can about them.

Insects will most likely form the subject of your first objects and here there is a vast field of highly interesting and beautiful matter available all the year round. The wings of flies, butterflies and moths, legs and heads of beetles and spiders, eyes of various kinds of flies are all worth spending quite a time in examining with different powers.

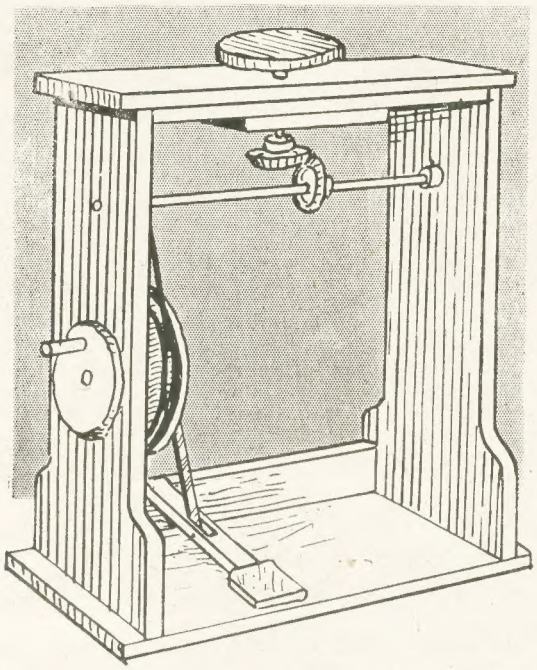
Turning for a moment to flowers and leaves we have such an array of specimens that it would be impossible to examine but a very small portion of them. Flowers can be taken to pieces to inspect the petals, stamens, the various kinds of hairs on the leaves and stems. The stems themselves can be examined by cutting off very thin slices with a razor blade.

Some people specialize in pollens and it is most interesting to note the different forms for each flower, as there is a different shaped pollen grain for every kind of flower.

Do not hurry over your examination of any object—get the light adjusted correctly and the focus right and then if possible have a note book to record your observations and to make drawings of what you have seen. You will thus be entering the field of scientific research in a fitting manner. A later article will tell you how to prepare and mount some interesting objects on to slides ready for observation.

An unusual piece of work to undertake is this 8in. tall

MODEL POTTER'S WHEEL



THIS rather unusual model, suggested by a reader, may prove an interesting piece of work. The framework is of fretwood, ¼in. thick, the same wood being used for other parts except those which cannot be made successfully and are better purchased. These parts are a pair of Meccano ⅞in. bevel wheels, and three collars of the same type, with a few inches of ⅛in. metal rod for spindles.

Make the stand first. This consists of two sides, a base, and a top. Patterns for the two former parts are given in Fig. 1. (A) is the sides. Cut two of these to shape and dimensions, making the tenons 1in. long, and ½in. apart for the bottom pair.

In the one for the left-hand side glue a 1in. strip of the fretwood down the centre, as shown by dotted lines, and at the spots indicated drill holes for the driving wheel and upper spindle carrying the pulleys and bevel wheel.

That for the driving wheel is ¼in. diameter and that for the upper spindle ⅛in. In the right-hand side drill the ⅛in. spindle hole only, and get both these holes truly in alignment by careful measurement. The base (B) is cut to dimensions given, and then the mortise slots sawn out to fit the tenons of the sides.

The top of the stand is shown at Fig. 2. It is the same length as the base and has the mortises sawn out to fit the top tenons of the sides. A side view of this top is given to explain more fully the following details. Firstly, glue the sides to base and top, then, when the glue is hard, cut two ¼in. strips of the fretwood, to a length to fit between the sides of the stand, and glue them underneath the top, one each side. Cut a piece of the wood 2ins. wide and 2½ins. long.

Table Action

In the centre of this drill a ⅛in. hole, then glue this across the strips underneath, exactly in the centre of the stand. In the centre of the top drill a similar hole. Measurements being correct, these two holes should be truly in line, and care must be taken to see they are, as they form the bearings for the vertical spindle carrying the rotating potter's table.

Now cut a ½in. wide strip of the fretwood and glue and nail this between the sides and the base, right at the back edge of the stand. This completes this part of the model, and it would be a good idea to clean it up with a rubbing of glasspaper, and then to paint or enamel it whatever colour decided upon. Grey would be a pleasing choice, unless something a little more brilliant would be preferred if the model is for a young boy.

Driving Wheel

The driving wheel, Fig. 3 (C) consists of a pair of fretwood discs, glued together, and bored through with a ¼in. hole. The smaller disc is 2½ins. diameter and both should be cut with accuracy. A groove on the edges to hold the belt, can be filed round, using a three-cornered file for the purpose.

In the absence of a lathe, it is a capital idea here, to ensure accurate roundness, to use an ordinary metal drill as an improvised lathe, by gripping the drill in a vice, bolting the wheel on a ¼in. by 1in. brass bolt, and fixing the bolt between the jaws of the drill. With the assistance of an obliging friend to turn the handle of the drill, and holding the file to the edges of the wheel, quite an accurate groove can be obtained in both, little inferior to lathe work.

Rod Fixing

On the outside of the wheel glue a ⅜in. or ¾in. disc of ⅛in. fretwood, to lessen friction against the sides of the stand. In the hole glue a 1½in. length of ¼in. dowel rod, the portion of rod sticking out to pass through the hole in the side of the stand.

For the pitman to act on the wheel, drive partly in a ⅜in. round-headed brass screw, just ¼in. out of centre. Now try

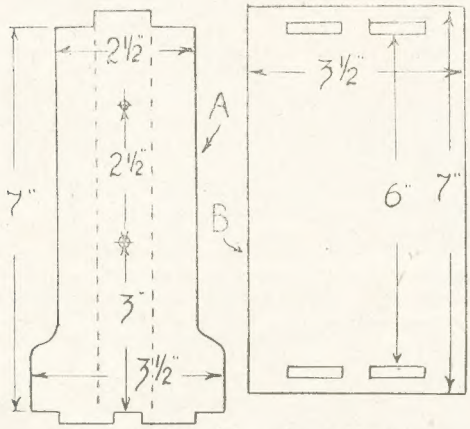


Fig. 1—Sides and floor pieces of model

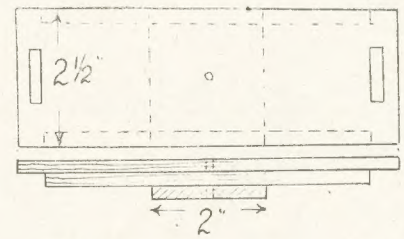


Fig. 2—Plan and side view of top of stand

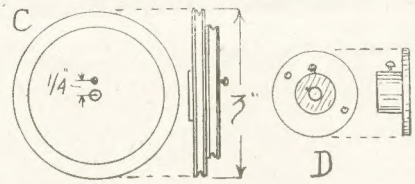


Fig. 3—Details of driving wheel and pulleys

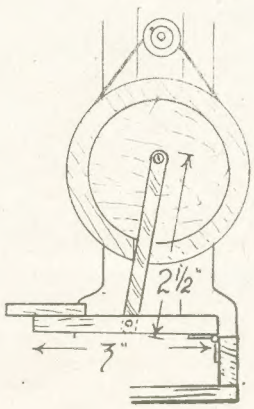


Fig. 4—Driving wheel treadle action

the wheel in place, and glasspaper the hole, if necessary, to ensure the wheel running smoothly.

The treadle, Fig. 4, is a length of the fretwood ¾in. wide. At about the spot indicated cut a ½in. slot through, the slot to be 1/16in. or, perhaps, a little more, wide. At the fore-end of the treadle glue a small square of ⅛in. wood as a footplate. For the pitman a piece of metal strip, ¼in. wide is cut. Near each end drill a hole through, that at the top being large enough to take the screw on the driving wheel, and that at the bottom a ¾in. wire nail.

The pitman is held in the slot by driving the nail through the side edge of the treadle, the nail passing through the hole in the lower end of the pitman. Now hinge the rear end of the treadle to the back strip, glued to the base of the stand, in the correct position for the pitman to nearly, but not quite, touch the driving wheel. Remove the screw on the wheel, pass it through the hole in the pitman, and then rescrew it in place. See the whole works smoothly.

An ⅛in. metal spindle will now be wanted, long enough to pass through the upper holes in the stand, and reach across. This is to carry the pulleys which connect with the driving wheel, also the bevel wheel mentioned. The construction of the pulleys is identical with that employed for the driving wheel. One is ⅝in. diameter and the other ⅞in. glued together, with an ⅛in. hole drilled through both.

To fix these to the metal rod, obtain a ¾in. disc of sheet metal and sweat it to a Meccano collar, as at (D) in Fig. 3. Drill small screw holes in the disc, and continue the hole in the collar through the disc as well. Now screw the disc to the larger of the pulleys.

From the left side push the rod through its bearing holes, threading on it in turn, the pulleys, the bevel wheel, and a second collar. Fix the pulley, and right side collar, to prevent the rod slipping, or riding sideways. Now connect the driving wheel to its pulley above with a strong elastic band, and see the works respond smoothly when the wheel is turned.

The vertical spindle is a ⅛in. metal rod. Push this through the hole in the top of the stand, and fix the second bevel wheel on it, at the bottom. Adjust the position of the bevel wheel on the spindle below until both mesh satisfactorily.

Cut off any surplus of the vertical rod, allowing it to stand above the top about ¾in. Take the third collar, and sweat a metal disc to it as done for the pulleys. Fit this to the top of the spindle. Now cut a 2in. disc of fretwood and screw the disc on the collar to the centre of the wood disc, underneath.

As it is unlikely that the model will work smoothly by movement of the treadle, glue a circle of fretwood, say, 2ins. diameter to the wood rod, extending outside the stand, and drill the disc near the edge for a 1½in. length of similar rod, which can be glued in as a handle.

Finish the model by painting the remainder, except the top and rotating disc, which are better left plain. A spot of oil on the bevel wheels will help to ease the works, the holes in the sides can be best lubricated with a little graphite paste, a job done before the driving wheel, and spindle above, are finally fitted.

Some tips about the importance of correct

MARKING AND MEASURING

IT is surprising what a difference good marking and measuring can make to a job. The accuracy of joints is, of course, very dependent on the marking out, but have you ever thought that the appearance of a joint in wood can be affected by the way it is marked? It can, as you will see. Here are some of the rules that good woodworkers follow.

First, using a knife before sawing. When marking for a saw cut, as in tenons, trench joints, etc., when you have fixed the position of the saw cut, mark it with a marking-knife. This cuts the fibres of the wood and prevents them being torn out by the saw teeth. In fact, many craftsmen say "knife your saw marks and pencil all others".

A tenon shoulder and trench joint are usually marked with the aid of a try-square. Think, before using the square, of the shape of the marking-knife blade. It has a V-shaped edge and will leave a V-shaped cut. Therefore, put the blade of the square resting on the part of the wood to be left exposed and cut into the waste side, as in the diagram.

This will prevent leaving a little valley where the two pieces of wood meet each other, which makes a difference to appearance. You can give the saw a start by knifing deeply and then chiselling some of the waste away, as in Fig. 1.

Another thing to watch is the use of the rule. Generally speaking, it is not wise when marking joints to put the end of the rule against the edge of the wood. The black markings are far easier to sight against the edge of the wood.

If you are marking a line, say, 3ins. from the end of the wood, using the try-square, put the end of the rule against the blade of the square and slide it along until the 3in. mark is in line with the end. Press the square firmly and mark your line, not forgetting to put your knife or pencil well into the angle where the blade meets the wood.

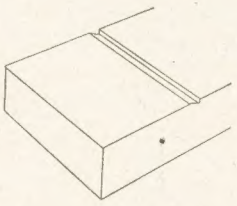


Fig. 1—A knife cut before starting to saw

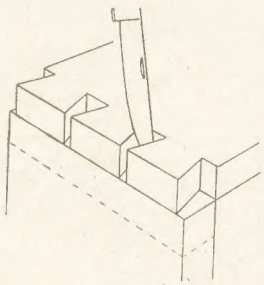


Fig. 2—A penknife is useful for cleaning dovetails

The marking gauge, used for making lines parallel to the long edge of the wood, should always be used with the grain and not against it, because it might catch in the grain and run off its true course.

For some awkward little jobs in marking you have a good friend in your penknife. Its slender blade can reach some tight corners. For instance, good dovetails have nice thin pins on them and the penknife is handy for getting down between the dovetails when marking out (see Fig. 2). This is much better than using a scriber which gets caught in the run of the end grain.

You have another example to follow in Fig. 3. If you mark the waste pieces of your wood with crossed lines immediately they have been marked you reduce the danger of cutting on the wrong side of the line.

Equal lengths, such as a set of table legs, should always be marked together, clamped up in alignment. For an experiment, try marking 12in. lengths separately on three or four pieces of wood. Then put the pieces side by side and see if they meet exactly.

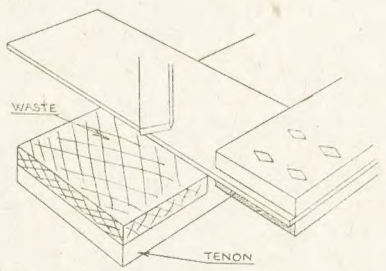
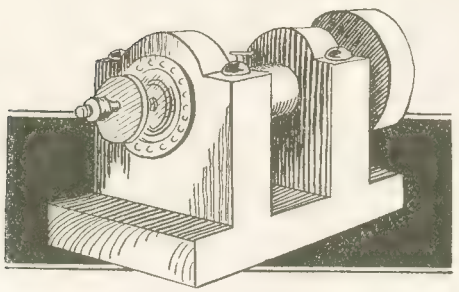


Fig. 3 — Marks to show waste wood, prevents cutting danger

If they do, you have an exceptionally good eye for accuracy! Always, if you can, mark equal lengths together, but if the pieces cannot conveniently be put side by side, then set a pair of dividers to the correct distance and use them as a gauge.

One last thing: Keep the pencil, dividers, and all other marking tools very sharp.

For emery work or buffing you should assemble a BALL-BEARING WHEEL



ALTHOUGH this emery wheel and buffing unit is made entirely from scrap, it is, nevertheless, as reliable as an expensive precision-built job. It is capable of a heavy load at very high speeds, and the bearing adjustments are such that frictional loss is reduced so that good output can be obtained from quite a small driving motor.

The main mechanical part of the unit is nothing more than the hub of a bicycle wheel. Of all items which find their way to the scrap heap or rubbish dump the discarded bicycle wheel seems easily to take first place, and there should be no difficulty in getting a suitable hub.

It matters little how bent or buckled the wheel is generally, as the rim and spokes are not needed and are cut away. Either wheel, front or rear, can be used, but the rear wheel, with its slightly longer spindle, is preferable.

The wheel can be dismantled quickly by cutting through all the spokes with wire-cutter pliers, and the short butt ends can be pushed out easily without a lot of tedious unlacing. The freewheel or sprocket which will, of course, have to be removed before the spokes can be taken out, need not be refitted as it is not necessary in the final assembly of the unit.

The stripped hub should be put into a jam jar or tin and covered completely with paraffin to free it of hardened grease and grit. After a thorough soaking completely dismantle the hub, unscrewing cones, locknuts and removing balls and spindle. Clean each part until it is bright and shining, with no speck of spent grease or dirt, and reassemble the hub, dry.

Adjust the loose cone very carefully so the spindle spins freely, but without noticeable side-play or shake. Make the adjustment permanent with the cone locknuts. It is not likely that the plating of the outside hub shell will be in very good condition, but this can be remedied by giving a coat of enamel.

This can, of course, be any colour, but it will give a more professional finish to the completed unit if the shell is painted a bright red similar to that which is used on small machine castings.

The wood used for the bed block and bearing supports is 1in. thick. The dimensions given in the diagrams are those used in the mounting of a rear hub of standard design, but it is possible that the hub which is available may vary slightly in overall width or diameter, and the measurements will need to be modified accordingly.

Although the woodwork of the mounting is very simple, the greatest possible care should be taken in cutting and finishing to ensure that the bearing supports stand perfectly square on the base block, and the hub must fit in the exact centre of each support.

As the measurements will be determined by the size and design of the available hub, it is best to begin by making the vertical supports. These should be cut solid from 1in. thick wood and finished accurately so that both pieces are identical in every measurement, particular care being taken to see that the bottom edge is properly squared (Fig. 1).

With a pair of callipers or two blocks of wood, measure the exact diameter of the middle of the hub barrel. If the hub is of the type in which the barrel is expanded at each end inside the spoke flanges to accommodate the ball cups, it will be necessary to measure also the diameter of the expanded portion. With the point (A) in Fig. 2 as the centre, mark circles to correspond with the hub diameters, and through the centre of the circles mark the line of division (B).

FIG 1

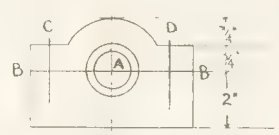


FIG 2

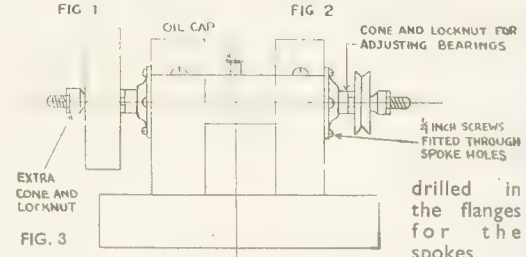


FIG. 3

The inner circle is cut out with a fretsaw and finished with a half-round file. The outer circle has to be taken out for a depth of about ¼in. only, just sufficient to allow the expanded ends of the barrel to seat in snugly. This is best effected with a small chisel.

Drill holes at points (C) and (D), and fit 1½in. screws. The screws may be either round-headed or countersunk, and after being fitted they should be taken out again temporarily so that the support may be cut in two at the division line (B). It will be seen that the screws having already been fitted, it is possible to clamp the pieces together without the risk of inaccurate register.

The hub when laid across the two lower halves should drop neatly into position, with the spoke flanges flat on the outside faces, and the spring-lid oil cap uppermost. Any slight imperfections should be remedied with a file or small chisel before fitting the top sections. The top halves, too, should fit easily so that when the screws are refitted the two sections are brought tightly together in the form of a clamp round the barrel of the hub.

The effect of the saw-cut at (B) will have reduced the vertical diameter of the circles slightly, but if the hub is not gripped tightly when the screws are put in, a thin shaving taken off the sawn edges will take up the slackness.

The base block is the same in width as the upright supports, and it should be sufficiently long to allow a 1in. extension beyond the uprights (Fig. 3).

Holes are drilled 1½ins. from each end and countersunk on the underside to take the four 1½in. screws which fix the vertical supports to the base block. The screws should be screwed tightly so that the uprights are held in position perfectly square and rigid.

To prevent any creeping of the hub when used under load at high speeds, the spoke flanges are fixed to the outer faces of the supports with ¼in. round-headed screws. Six or eight of these may be put in at each end, spacing them equally in the holes which are already drilled in the flanges for the spokes.

The driving pulley is made up of two discs 1¾ins. in diameter, and cut from ¼in. wood. Each disc is bevelled on one side and drilled with a ½in. hole in the centre. The bevelled faces are put together to form a V and are locked tightly together on the spindle between a cone locknut and a spare loose cone.

The object of this extra cone is that its tapered face engages inside the over-size hole of the pulley, and on being tightened the pulley is automatically centred on the spindle (Fig. 3). Cones and locknuts should be used also for fixing the emery wheel and buffer, or any other fittings which may be employed on the spindle.

This automatic centring action of the cones helps considerably in the smooth running and precision of the completed unit, especially when it is used at high speed. Fine adjustment to the ball-bearings, and the easy lubrication by means of the spring-lid oil cap ensure the maximum output from a small driving motor.

Some odds and ends can easily be converted into

A MODEL STEAM-ROLLER

WE have all seen the fascination with which a child watches the steam-roller at work repairing the roads. How thrilled he would be to possess one of his own! This sturdy wooden model is easily made, and will stand up to much rough handling.

The materials required are two 5½in. diameter wooden wheels, a block of wood 7ins. long by 3ins. wide by 3ins. deep, a 2in. diameter wooden rolling pin, a piece of wood 7ins. long by 3ins. wide by ⅜in. thick, four mild steel rods ¼in. diameter, threaded at one end with nuts to fit, a piece of ¾in. tubing 7ins. long, an 8in. strip of mild steel ⅝in. wide by ⅛in. thick, a short length of chain with screw eyes, a ¼in. bolt 4½ins. long and some coach screws and washers.

On top of the block of wood and ¾in. from the rear end, cut out a 2in. square hole, about 2ins. deep. This is best done by boring a ¾in. hole in each corner and squaring with a chisel to form the driver's compartment. At the front end of the block bore a hole 1in. deep and ¾in. diameter. The centre of this hole should be ⅝in. from the top and 1½ins. from each side of the block. Square the hole to just under 1in. each way with a chisel.

The Boiler

The boiler is made from part of the rolling pin. Cut off the knob at one end, then saw off a piece 5½ins. long. On the end of this section mark the centre, and then a square 1in. each way. Cut down these lines to a depth of 1in. with a fine tenon saw and, holding the wood in a V block or vice, saw off the surplus, leaving a tongue of wood 1in. square on the end of the boiler. If this has been done carefully, the tongue will fit tightly into the hole in the front end of the body of the model. Glue and fix into position.

Canopy

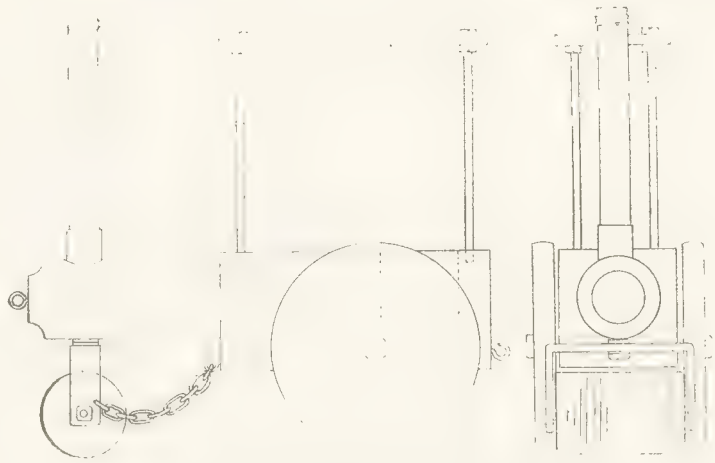
The canopy is made from a piece of wood 7ins. long by 3ins. wide by ⅜in. If plywood is used it need be only ¼in. thick. A distance of ½in. from each corner drill a hole ¼in. diameter (four in all). Using this wood as a template, place it on top of the body and mark the position of the holes. Then drill four holes $\frac{3}{16}$in. diameter and ½in. deep in the top of the body to take the stay bars.

These stay bars are made from the mild steel rods 6ins. long and ¼in. diameter. Cut a thread ¾in. long at one end of each rod, and fit two nuts to each. Most ironmongers or garages will supply these rods, and cut the threads if required. Put a nut on each rod as far as it will go and push the rods through the holes in the canopy, afterwards screwing up the second nut.

Now drive the four stays into the holes in the body, taking care to drive each one in a little at a time. The reason for this strong support is that a child puts most of its weight on to the canopy when pushing the model.

Chimney

The chimney is made from the piece of ¾in. diameter tubing. Close to one end solder on a ferrule, or bind a few turns of ⅜in. insulating tape round the tube.



A helpful side and front view of the parts

Mark 1½ins. from the front end of the boiler, and bore a ¾in. diameter hole on the top centre, to a depth of ¾in. Force the chimney into this hole, and glue in position if necessary. A few layers of insulating tape bound round the chimney to a height of 1in. above the boiler greatly adds to its appearance.

The Road Roller

To make the roller cut a section 3¾ins. long from the rolling pin. Carefully drill through the centre a ¼in. hole to take the spindle. When drilling long holes, it is advisable to use a small diameter drill first, and rebore afterwards with a drill of the required size.

The gamble which carries the roller is made from a piece of mild steel, 8ins. long by ¾in. wide by ⅛in. thick. In the centre drill a hole $\frac{5}{16}$in. diameter. At a point 2ins. from each end bend at right angles, to form three sides of an oblong. Drill two more holes $\frac{5}{16}$in. diameter, one in each limb of the gamble ½in. from the end. Make sure that the spindle, when passed through the holes, will be parallel with the top of the gamble. Finally drill a hole ⅛in. diameter in each limb, ⅛in. from the edge and 1in. from the bottom, for the chains to hook into.

Fix the gamble to the underside of the boiler with a 1¼in. by ¼in. coach screw, drilling an ⅛in. diameter hole in the centre of the boiler, 1½ins. from the front end. Screw the gamble into this hole, putting one or two washers between it and the boiler.

Now push the 4½in. bolt through one limb of the gamble, fit a washer, pass the spindle through the wooden roller, fit another washer, pass the bolt through the other side of the gamble and put on a nut. See that the roller spins freely, then tap over end of thread with hammer to prevent nut working loose.

Fix two screw eyes into front end of the body and loop a piece of chain from the ⅛in. holes in the gamble to the body, so that the roller can turn about 1in. each side of its centre position.

Now fit the driving wheels. Drill a ⅛in. diameter hole each side of the body, 3ins. from the rear end and ⅜in. from the bottom. Drill the wheels to take a ¼in. coach screw, making the hole very slightly larger, and fix in position with a washer between each wheel and the body. The coach screws should be 2ins. long.

Finishing

The model can now be glasspapered and painted. Aluminium paint for the driving wheels, roller and gamble, dark green for the body and boiler and black for the remainder. The driving wheels can be removed for painting and when finally fixed, a spot of glue on each coach screw will prevent it working loose later If a small screw eye is fitted, one on the front and one on the rear, string can be attached to pull the model along, or for it to be hooked on to others.

In painting it is best to give a first coat of priming paint, which can be flat grey or of white. Let this get thoroughly hard before adding the second coat, laid on evenly and without drag.

Home Cements for Special Jobs

Cement for Jointing Hot-Water Pipes

This cement contains—by weight—80 parts of crushed iron filings, 2 parts of flour sulphur, and 1 part of powdered sal ammoniac; which ingredients must be well mixed dry, and then moistened with water some two hours before use. The pipe joint is first caulked a little more than half full with yard or old sisal string and then finished off with the cement. As the cement expands a little in setting, the caulking should not be carried out too solidly.

Cement for Fixing Letters to Glass

In cementing enamel or glass letters to windows, first dust french chalk over the glass, then coat the backs of the letters with a cement made some twelve hours previously from equal parts of white lead and the best gold-size; spreading the cement on to a thickness of at least $\frac{1}{8}$in. Press the letters well down, and scrape the excess cement from around them.

Another quicker-drying cement for the same purpose can be made up by mixing together 1 part of white lead, 2 parts of litharge, 3 parts of boiled linseed oil, and 1 part of copal varnish.

China to Metal Cement

The following cement must be kept in a tightly-closed bottle and is useful for uniting china to metal. It is made by mixing 20 parts of rosin, 1 part of boiled linseed oil, and 2 parts of plaster of paris. It should be heated before use.

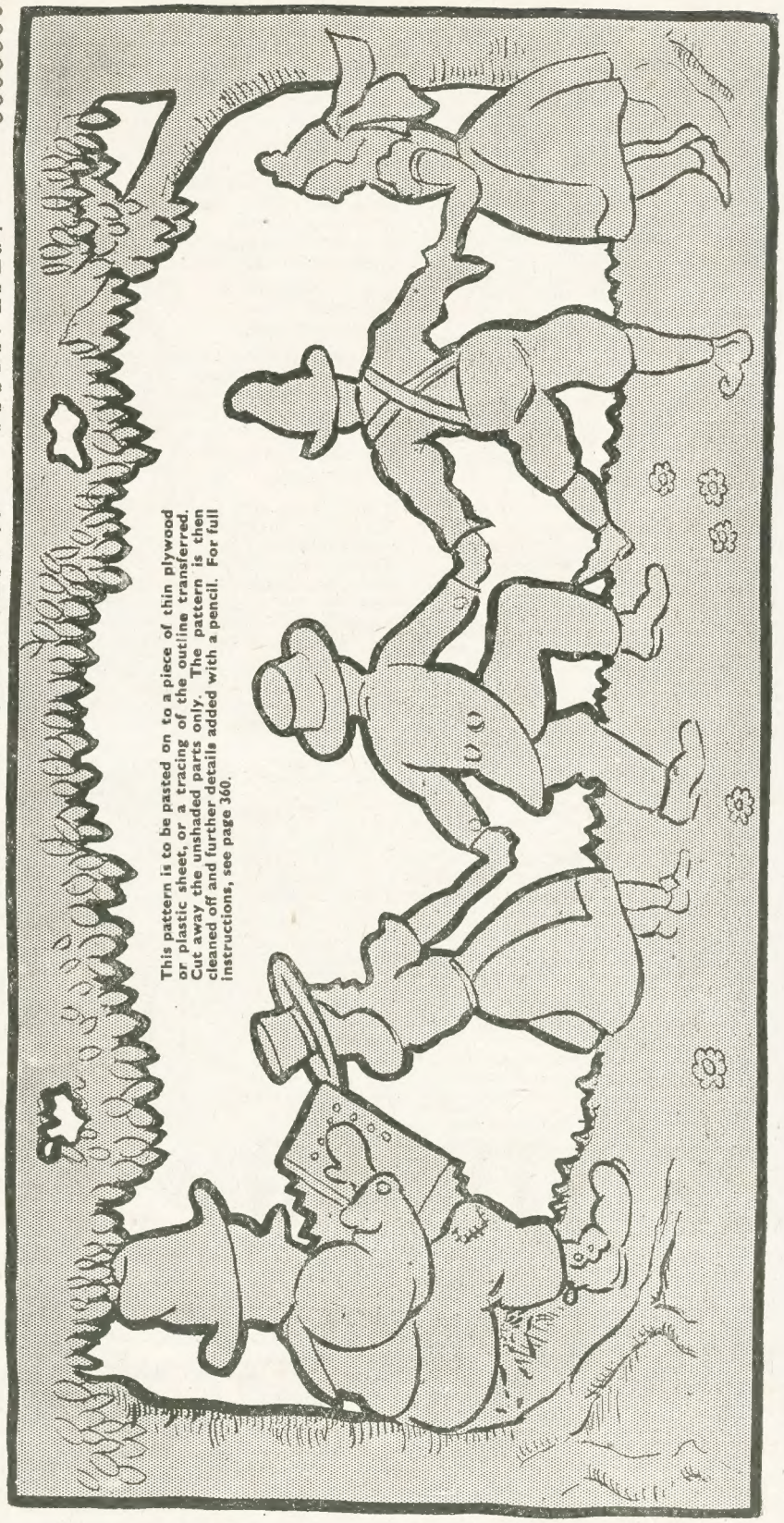
Adhesive for Fixing Gold-leaf to Glass

Weak isinglass dissolved in rain-water is the best adhesive for this purpose, for the cracking and chipping due to the use of japan or gold-size is because these adhesives contract and expand to a large degree with temperature changes. The glass should first be painted with a 'backing' of red-lead, ground in varnish and thinned with pure turpentine.

Cement to Withstand Oils

A cement to fulfil this requirement is made by dissolving 1 part of caustic soda in 5 parts of water, and boiling with 3 parts of rosin till all are dissolved; finally adding about half the entire weight again of plaster of paris or chalk. It must be used at once, as it hardens very rapidly. This cement will take the place of either red-lead or white-lead cements.

Common soap or glue are also excellent lutings to use where the action of oil has to be withstood.



This pattern is to be pasted on to a piece of thin plywood or plastic sheet, or a tracing of the outline transferred. Cut away the unshaded parts only. The pattern is then cleaned off and further details added with a pencil. For full instructions, see page 360.

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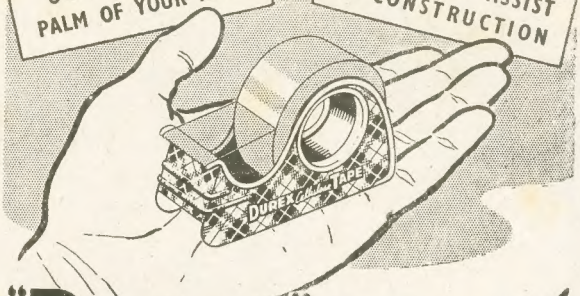

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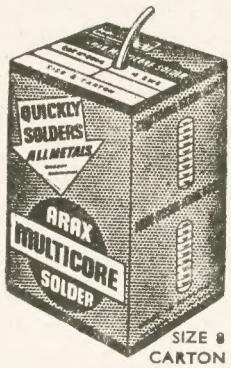

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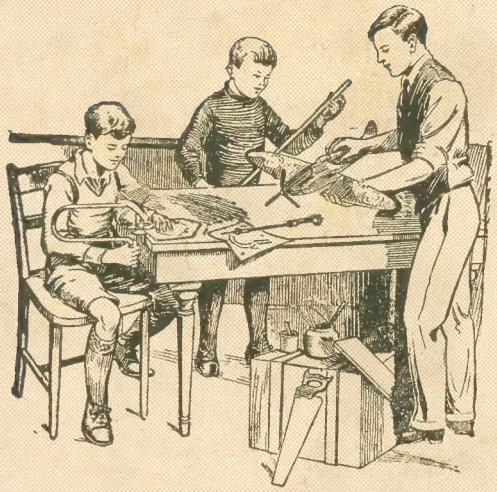

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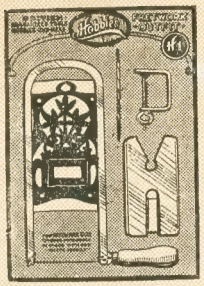
BRITISH FRETWORK OUTFITS

Each contains all you need to make a start. The tools are of high quality material, and instructions provided how to use them. Either is a set you can be proud to buy or give. On coloured cards 14¾ins. by 19¾ins.



These tools are all mounted on strong cards in bright colours, making a striking outfit. Each tool is of Hobbies' high quality and each set contains sufficient to make a start. For those who cannot afford the boxed outfits, these are of really sound value.

The H3 Outfit

On larger card with extra tools. Set includes 12in. frame and spare blades, fretwork, drill and point, cutting table and cramp, 6in. steel rule, design and working instructions.

12/6 *Postage 9d.*

The NELSON Outfit

A handframe, a polished steel cutting table with cramp, an archimedean drill with bit, a glasspaper block, spare sawblades, hammer, 6in. rule, wood and design for a model.

17/6 *Postage 9d.*

The H2 Outfit

A useful range for the beginner. Includes 12in. frame and saw, cutting table and cramp, fretwork bradawl and spare blades, designs and instructions.

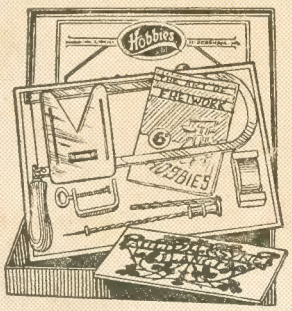
9/- *Postage 9d.*

TOOLS WHICH REALLY DO THEIR JOB

The ENSIGN Outfit

An 11in. handframe, drill with bit, a small wood-handled hammer, polished cutting table with cramp, spare sawblades, wood and design for a model.

15/6 *Postage 9d.*



The CROWN Outfit
(Illustrated)

With useful small handframe, spare saws, cutting table, drill, instruction book, glasspaper block, wood and design.

16/6 *Postage 9d.*

The NATIONAL Outfit

With special comfortable grip handframe, spare saws, cutting table, drill, glasspaper and holder, wood, designs and instruction book.

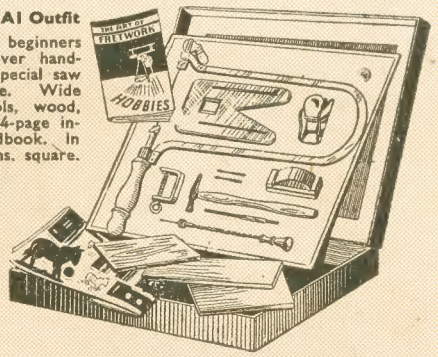
23/6 *Postage 11d.*

The Popular A1 Outfit

The set most beginners demand. Lever handframe, with special saw tension device. Wide range of tools, wood, designs and 64-page instruction handbook. In deep box 15ins. square.

29/-

Postage 1/-



Also the **A3 Set**, the best of all, with even wider and better range of tools for

52/6 *Postage 1/3d.*

For Toymaking - Model Making - Puzzles - Fretwork - Light Woodwork - Metalwork

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